

IMPROVING THE PROPERTIES OF A SILICA THIN FILM PRODUCED BY A RAPID VAPOR DEPOSITION (RVD) PROCESS

ABSTRACT OF THE DISCLOSURE

5 A rapid vapor deposition (RVD) method conformally deposits a dielectric material
on small features of a substrate surface. The resulting dielectric film has a low dielectric
constant, low wet etch rate, low film shrinkage and low stress hysteresis, appropriate for
various integrated circuit dielectric gap fill applications such as shallow trench isolation.
The method includes the following two principal operations: depositing a thin conformal
10 and saturated layer of aluminum-containing precursor over some or all of the substrate
surface; and exposing the saturated layer of aluminum-containing precursor to a silicon-
containing precursor gas to form a dielectric layer. In some cases, the substrate
temperatures during contact with silicon-containing precursor are greater than about 250
degree Celsius to produce an improved film. In other cases, post-deposition anneal
15 process may be used to improve properties of the film. Generally an inert gas purge is
employed between the introduction of reactant gases to remove byproducts and unused
reactants. These operations can be repeated to deposit multiple layers of dielectric
material until a desired dielectric thickness is achieved.

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